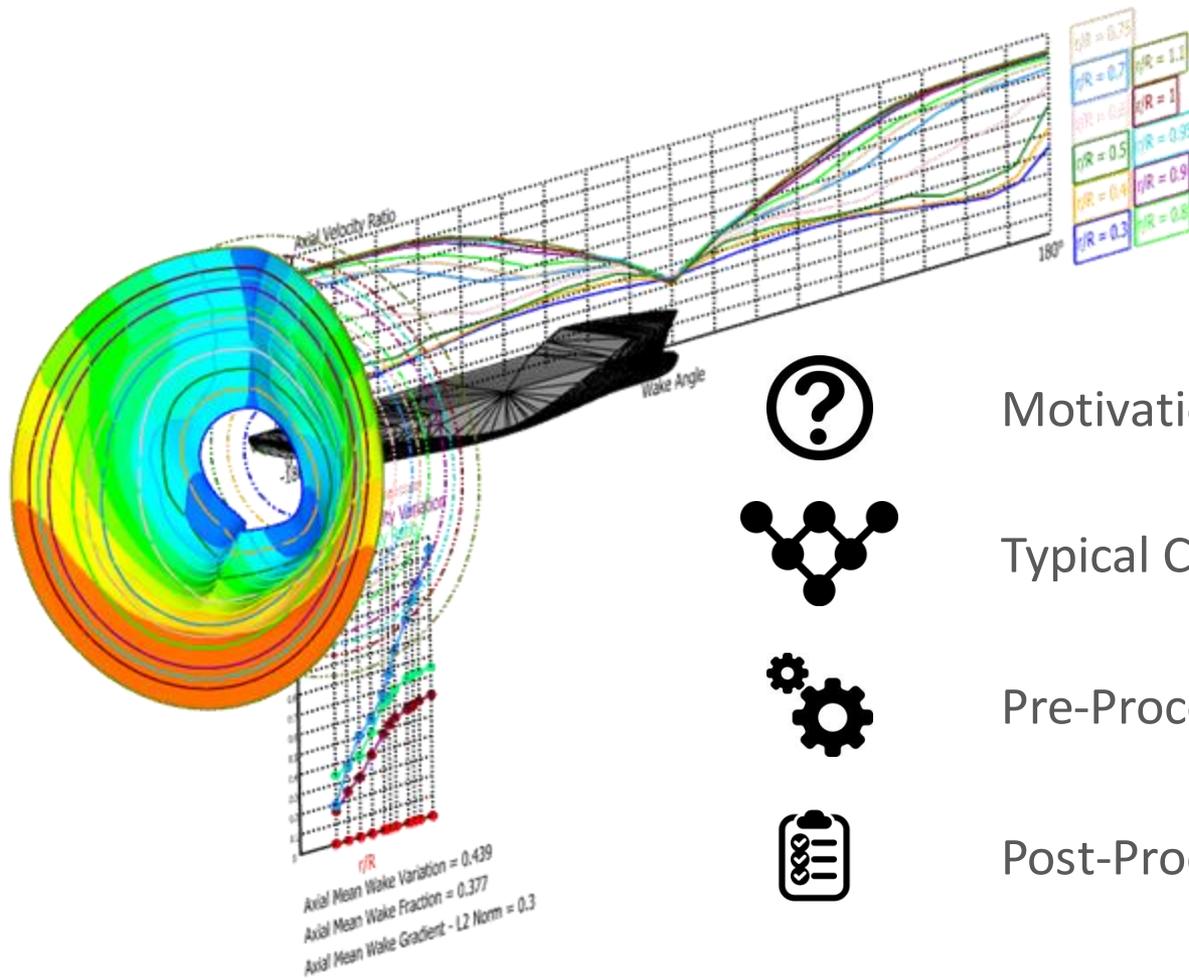


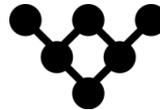
Pre- and post-processing tools developed in CAESES to prepare and assess marine CFD simulations for resistance and self-propulsion

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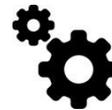
Agenda



Motivation



Typical CFD Project

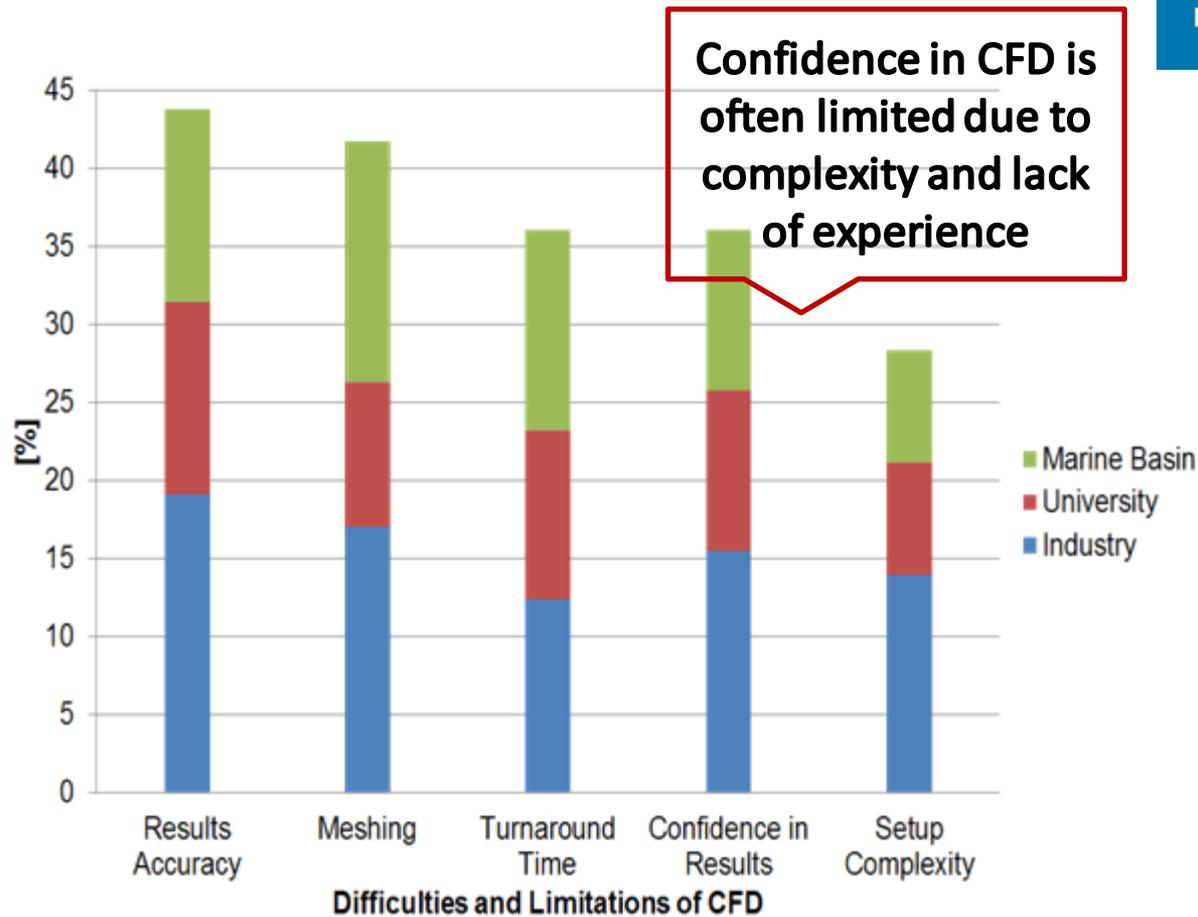


Pre-Processing Feature Tools



Post-Processing Feature Tools

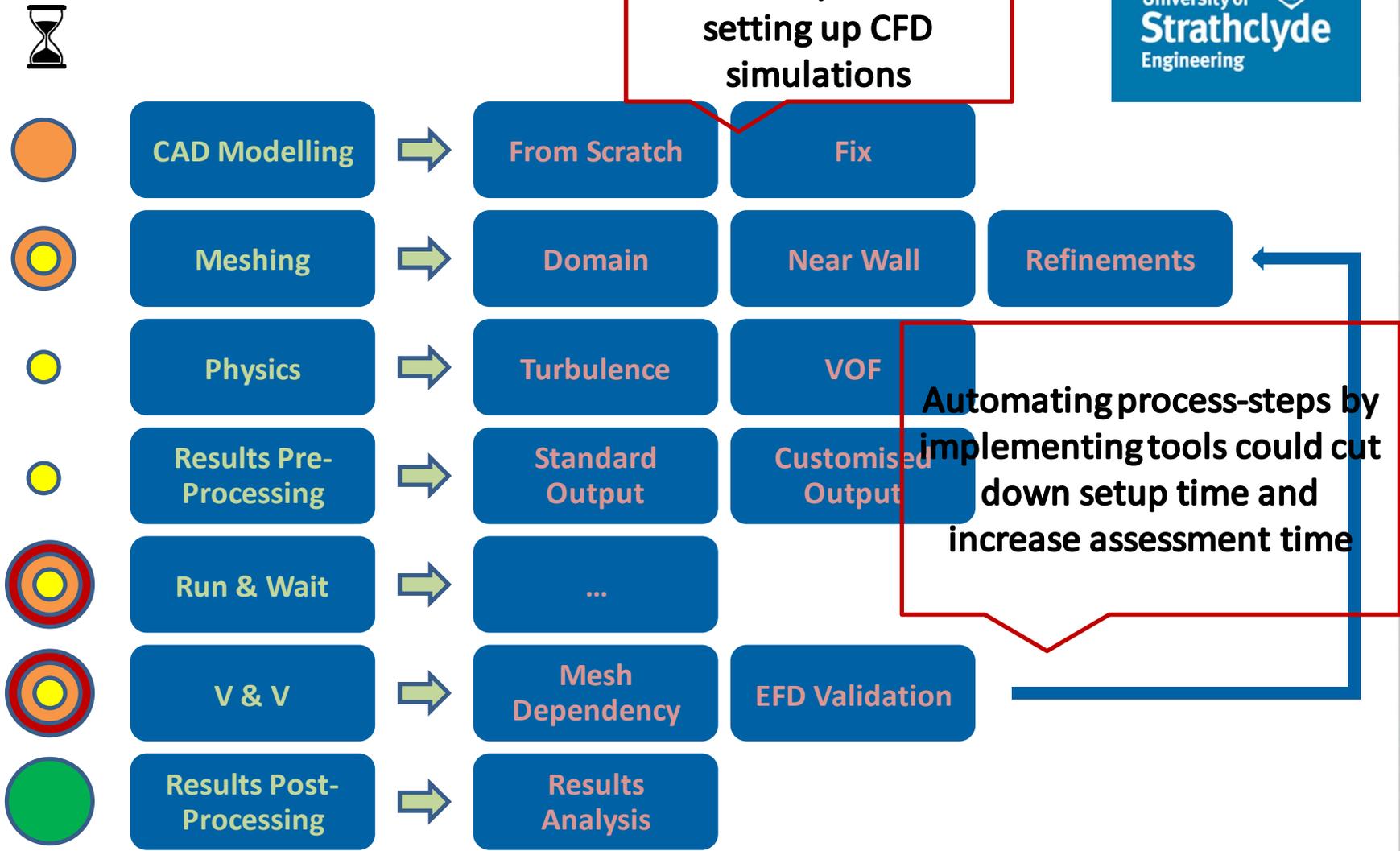
Motivation



ITTC survey about CFD user issues, cf. (ITTC, 2011)

Typical CFD Project

Yellow, orange & red bullets indicate time that is spent for setting up CFD simulations

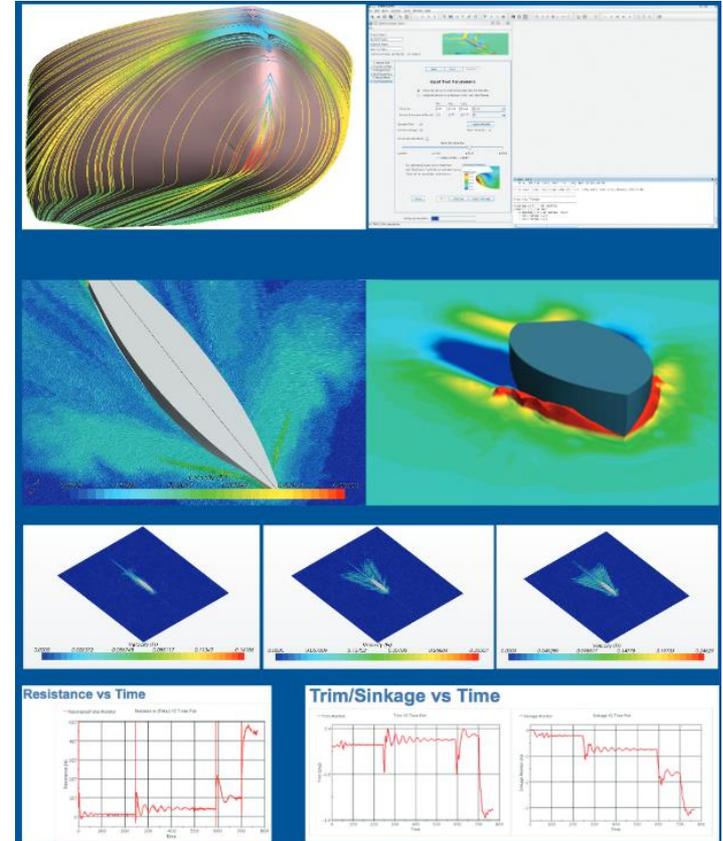


Typical CFD Project

Commercial
example of
such a tool

EHP - Estimating Hull Performance in STAR-CCM+

- Automated pre- and post-processing
 - Nominal simulation
 - Half domain
 - Low Y+ treatment
 - Multiple speeds manual batch run
- What are the limitations?
 - Self-propulsion
 - Full domain
 - Variable Y+ treatment
 - Automatic batch runs

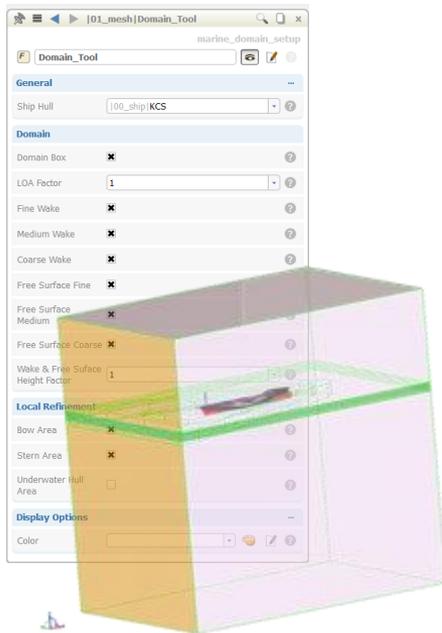


<https://mdx2.plm.automation.siemens.com/brochure/estimating-hull-performance-brochure-ehp>

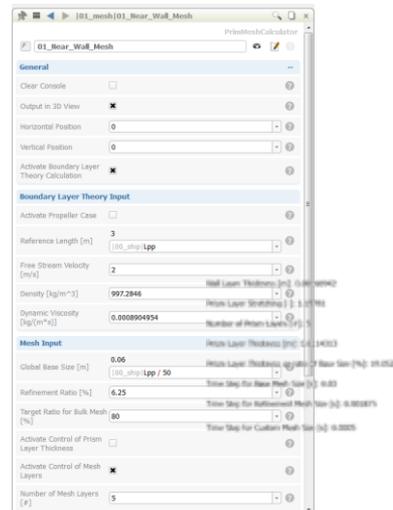
Feature Pre-Processing Tools

Self-developed tools to setup a CFD domain along with refinement regions, control the near wall mesh and automatically assess the CFD results using a V&V procedure

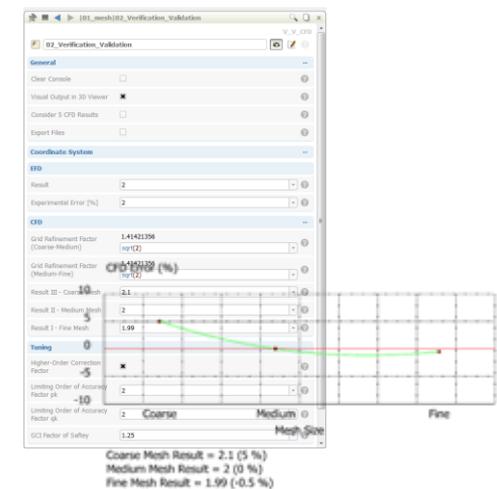
Domain Tool
Local and Global
Mesh Control



Prism Layer Tool
Near Wall Mesh
Control



Verification & Validation Tool
Mesh Dependence
and EFD Comparison

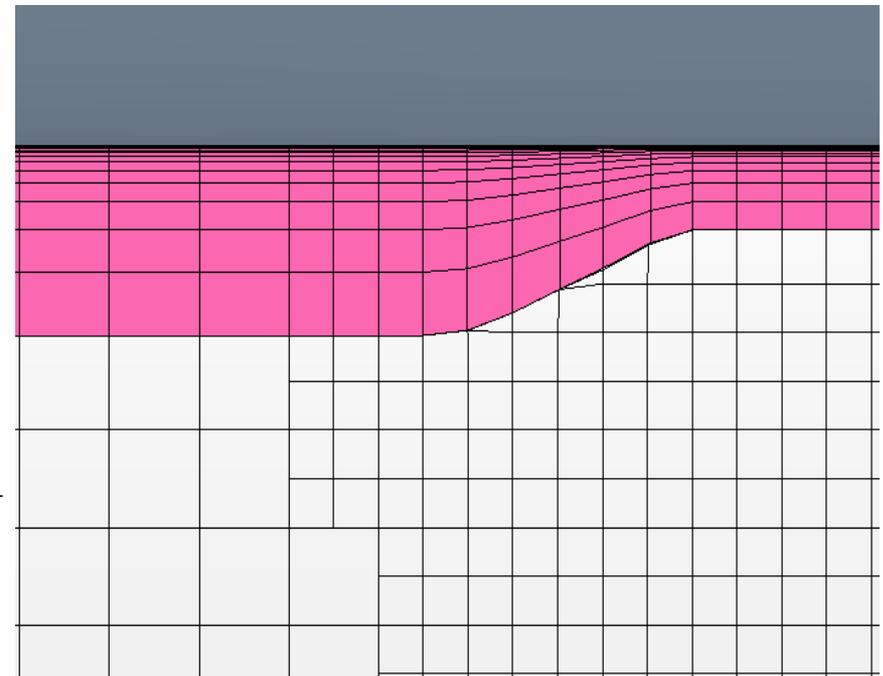
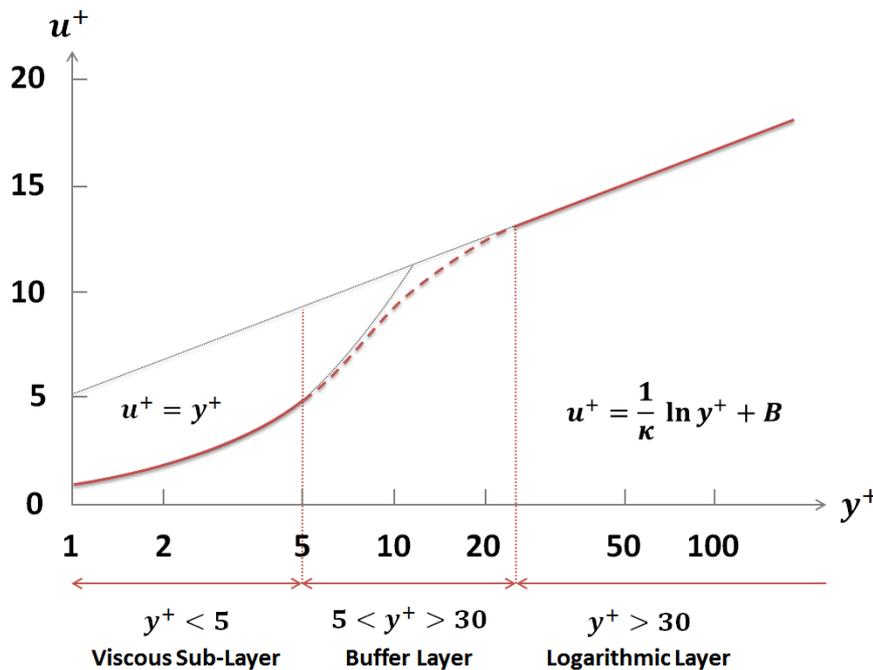


$|JECI| = 0.5 < UV = 2.21178$ -- UNCORRECTED RESULTS ARE VALIDATED
 $|JECI| = 1 < UNC = 2.04879$ -- CORRECTED RESULTS ARE VALIDATED

Feature Pre-Processing Tools

Active control of near wall mesh by adjusting number of mesh layers, wall height of first layer and cell stretching

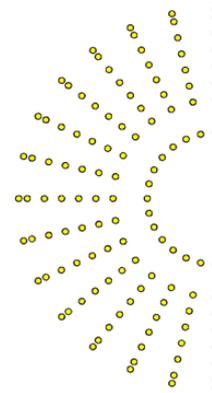
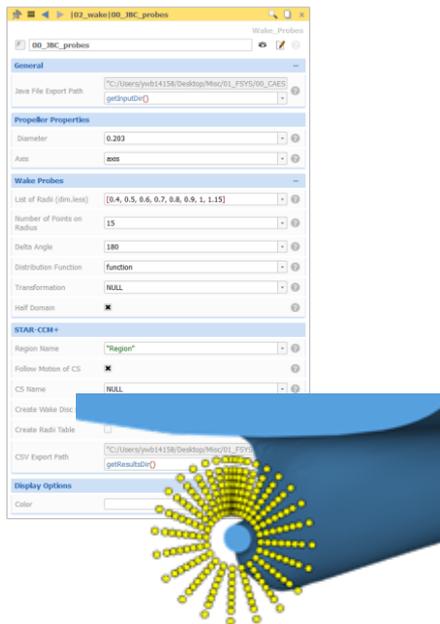
$$y_{Prism} = y_{Wall} \cdot \left(1 + l_s + l_s^2 + \dots + l_s^{(n-2)} + l_s^{(n-1)} \right)$$



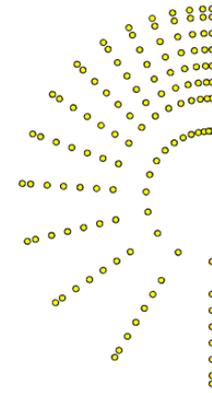
Feature Pre-Processing Tools

Automated post-processing of ship wake field for a CAESES-STAR-CCM+ connection

Flow Probes Tool Wake Probes Generator

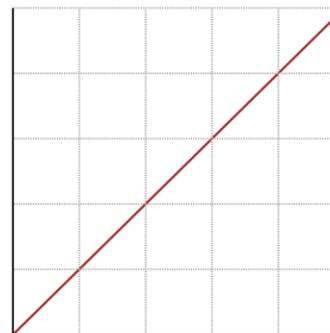


Linear Distribution



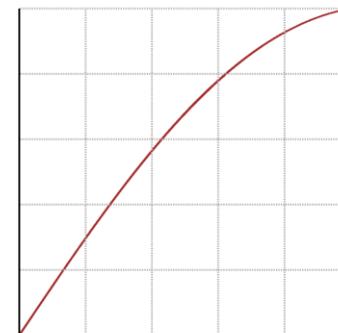
Distribution concentrated in
Wake Shadow

Wake Angle



Points Distribution along Radius

Wake Angle



Points Distribution along Radius

